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### REMARKS

Claims 1 – 27 are pending in the present Application. Claims 1, 14, and 25 have been amended. No new matter has been introduced by these amendments. Support for the amendment to claims 1 and 14 can be found in line 3 of paragraph 51 in combination with Figures 3, 5, and 7, with each showing at least three electrical contacts / connections. Support can also be found in paragraphs 43, 44, and 46. Support for the amendment to claim 25 can be found in paragraph 25.

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

The Office Action of Nov. 11, 2005 addressed claims 1-27. Claims 1-27 were rejected.

I. Rejection of Claims 1, 2, 4, 12-15 and 13-26 under 35 U.S.C. § 103(a) - Yazu et al. (EP 220463) in view of Fujikawa et al. (US 6,285,010): The Examiner rejected claims 1, 2, 4, 12-15 and 13-26 under 35 U.S.C. § 103(a), as being unpatentable over Yazu et al. in view of Fujikawa et al. Applicants respectfully traverse this rejection.

In making the rejection, the Examiner states that in the Yazu et al. reference, "There are two separate heating means in the chamber to create the high temperatures. The heaters are controlled separately to create the temperature gradients, note figures." Furthermore, "[t]he Fujikawa et al reference teaches a HP/HT apparatus where the heaters are separate and separated by insulation means, note figure2." It is therefore obvious to modify the Yazu et al. apparatus to separate the heaters by insulation in order prevent the heaters from affecting each others zones thus increasing control of the heating.

Claim 1 as presently amended is directed to an HP/HT apparatus having at least two different heating paths between the heating element the electrical power system for powering the heating element, at least three electrical connections for connecting the electrical power system to the at least two different heating paths; and wherein at least an electrical insulation is disposed within a pressure vessel in the apparatus for establishing the different heating paths.

Yazu et al. discloses a synthesizing vessel having "a disk-shaped heater 28 on the top portion of the cylindrical heater 24 and a heater 29 having small sectional area in contact with the heater 29" (column 5, lines 18-22). The heaters are arranged and heated such that "*the whole body*" has a temperature gradient as illustrated in Figure 5 can be obtained. "The temperature ... can be decreased in the direction from a top portion of the vessel to a bottom portion thereof as shown in Fig. 5." (column 5, lines 15-27). Applicant respectfully submits that Yazu et al. apparatus has only one electrical path and does not have the means to separately control the heater temperatures, as the Yazu et al. temperature gradient as illustrated in Figure 5 is that of one long linear temperature gradient. Yazu et al. does not

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disclose nor teach an apparatus wherein the temperatures of the different stages of the cell can be independently controlled by at least two different heating paths or the use of a coolant with differential cooling.

The apparatus of claims 1, 2, 4, 12-15 and 13-24 with at least two different heating paths allows the heaters to be independently controlled and thus, providing the different temperature profiles as illustrated in Figures 13 and 15. The apparatus of claims 25-26 employs differential cooling with a coolant to obtain differential temperature control.

With respect to Fujikawa et al. apparatus, first of all, the HP/HT apparatus as disclosed is a gas pressure apparatus for processing semiconductor wafers, *not* relying on a liquid or a solid for a pressure transmitting medium as in the apparatus of the invention. Secondly, Applicant respectfully submits that Fujikawa et al. does not disclose how electrical current is supplied to heater 13, which is divided into separate zones 13a and 13b, as arranged on an insulating material 12. In similar apparatuses for processing semiconductor wafers, power is normally supplied through electrical feedthroughs, which comprise a metallic rod or wire embedded in a ceramic cylinder (with both ends open). The ceramic cylinder in turn is embedded in a wall or flange of the pressure vessel. The seals between the metallic rod and the ceramic cylinder and between the ceramic cylinder and the wall or flange must be gas-tight and able to withstand gas pressure. However, such an arrangement for supplying electrical current to a heater in a high-pressure cell with a solid or liquid pressure medium will simply not work in the apparatus of the invention. The feedthrough would be crushed, causing both electrical and pressure failure. Therefore, Applicant respectfully submits there is no motivation to one of ordinary skill in the art to look to Fujikawa et al. to modify the Yazu et al. apparatus to increase control of the heating as in the apparatus of the invention.

As Fujikawa et al. does not make up for the deficiencies of Yazu et al., the combination of Yazu et al. with Fujikawa et al. still does not produce the claimed invention. When the primary reference does not teach all elements of the claimed invention, then the secondary reference must provide those elements in order for the combination of references to contain all the claimed elements as required by law. Applicant therefore respectfully requests a withdrawal of the §103 rejection over Kumar et al. in view of Yamazaki et al.

II. Rejection of Claims 3 and 27 under 35 U.S.C. § 103(a) - Yazu et al. (EP 220463) in view of Fujikawa et al. (US 6,285,010): The Examiner rejected claims 3 and 27 under 35 U.S.C. § 103(a), as being unpatentable over Yazu et al. in view of Fujikawa et al. Applicants respectfully traverse this rejection.

The Examiner indicates that the two references differ from the instant invention in the material treated. However, it would have been obvious to one of ordinary skill in the absence of unexpected results, to determine through routine experimentation the material to be treated in the Yazu et al. reference to improve the usefulness of the HP/HT apparatus.

The Yazu et al. reference relates to synthesizing cBN from hBN, wherein *hBN* is

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*converted to cBN* under the action of the solvent. The Fujikawa et al. reference "relates to a method and device for *treating ULSI semiconductors represented by Si wafer*, ... particularly, to a method and device for treating semiconductor wafers in a small lot of 1 to 25 pieces." (column 1, lines 9-13, Field of the Invention).

Claims 3 and 27 as amended relate to a gallium nitride single crystal, as grown in the apparatus of the invention with at least two different electrical heating paths and at least three electrical connections, has a dislocation density of less than  $10^4$  per  $\text{cm}^2$  and at least one of a diameter and a thickness of greater than 0.05 cm. As the apparatus allows for independently controlling the temperatures of at least two locations in the vessel, the gallium nitride as grown in the apparatus using a liquid or solid pressure-transmitting medium, has a dislocation density of less than  $10^4$  per  $\text{cm}^2$  and at least one of a diameter and a thickness of greater than 0.05 cm. As indicated in Example 1 of a prior art cell (without the at least two different electrical heating paths of the present invention), the largest crystal obtained in the apparatus of the prior art has a size of 0.5 mm in diameter and thus, a low quality GaN crystal.

Applicants respectfully submitted that obtaining gallium nitride crystals with a dislocation density of less than  $10^4$  per  $\text{cm}^2$  and at least one of a diameter and a thickness of greater than 0.05 cm is not a simple matter of mere experimentation, as neither Yazu et al. in view of Fujikawa et al. teach nor disclose growing GaN crystals, let alone GaN crystals of the quality as claimed.

As the Examiner has not made a prima facie case of obviousness, Applicant therefore respectfully requests a withdrawal of the §103 rejection over Yazu et al. in view of Fujikawa et al., and an allowance of the claims.

III. Rejection of Claims 5-11 and 16-22 under 35 U.S.C. § 103(a) - Yazu et al. (EP 220463) in view of Fujikawa et al. (US 6,285,010): The Examiner rejected claims 5-11 and 16-22 under 35 U.S.C. § 103(a), as being unpatentable over Yazu et al. in view of Fujikawa et al. Applicants respectfully traverse this rejection.

In this rejection, the Examiner indicates that the two references differ from the instant invention in the heater type and construction. However, it would have been obvious to one of ordinary skill in the absence of unexpected results, to determine through routine experimentation the optimum, operable construction material and heater in the Yazu et al. reference to ensure that the apparatus will not fail structurally and uniformly heat the material being treated.

It's respectfully submitted and previously discussed, the combination of Yazu et al. and Fujikawa et al. fails to teach / suggest the invention set forth in claims 1 and 14. Since claims 5-11 and 16-22 depend from claim 1, it's respectfully submitted that these claims are also allowable over the prior art of record.

Applicant therefore respectfully requests a withdrawal of the §103 rejection over Yazu

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et al. in view of Fujikawa et al. and an allowance of claims 5-11 and 16-22.

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 50-2339.

Respectfully submitted,



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